Function Transformation Primer

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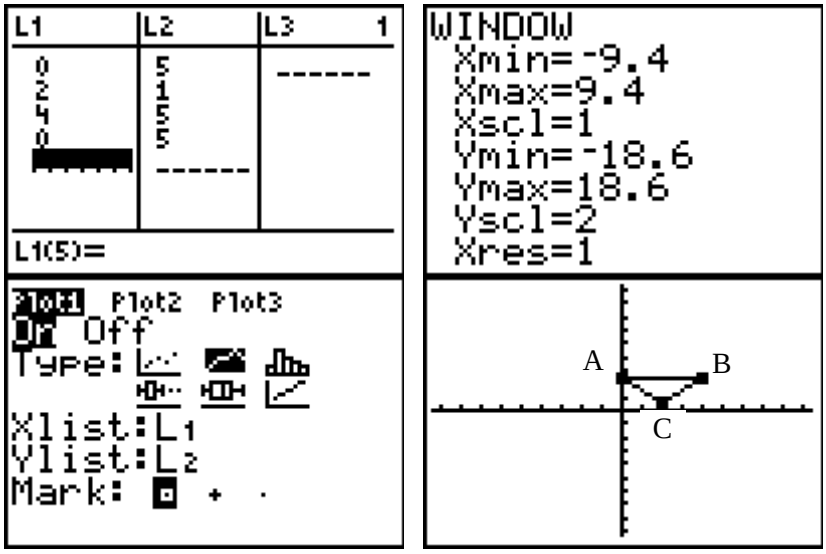
Draw a triangle with vertices at (0, 5), (2, 1), and (4, 5). This is easily done on the TI-83 as shown in the screens below. (Note: The initial vertex (point) is listed at the beginning and end in the list editor so that there is a line from vertex C to A.)



Prerequisite Information:
Using the features of list editor, it is possible to operate on all of the elements of a list by simply treating the list name as a variable. That is, for example, with your cursor on top of the list name L_3, the operation $3L_2$ will multiply every element in list L_2 times 3 and store the results in L_3. With the cursor on top of the L_3 name again, add 3 to L_2 and the results will erase the current elements in L_3 and replace them with the new values. (Note: The vertices labeled as A, B, and C do not need to be used on your calculator.)

1. With L_1 and L_2 creating the triangle ABC as shown above, multiply the *y*-coordinates of each vertex times –1 and store the results in L_3. Now plot L_1 vs. L_2 AND L_1 vs. L_3. Describe the relationship between the original triangle and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

2. With L_1 and L_2 creating the triangle ABC as shown above, multiply the *y*-coordinates of each vertex by –2 and store the results in L_3. Now plot L_1 vs. L_2 AND L_1 vs. L_3. Describe the relationship between the original triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

3. With L_1 and L_2 creating the original triangle ABC as shown above, multiply the *y*-coordinates of each vertex by –3 and store the results in L_3. Now plot L_1 vs. L_2 AND L_1 vs. L_3. Describe the relationship between the original triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

4. With L_1 and L_2 creating triangle ABC, multiply the *y*-coordinates of each vertex by 2 and store the results in L_3. Now plot L_1 vs. L_2 AND L_1 vs. L_3. Describe the relationship between triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

5. With L_1 and L_2 creating triangle ABC, multiply the *y*-coordinates of each vertex by 3 and store the results in L_3. Now plot L_1 vs. L_2 AND L_1 vs. L_3. Describe the relationship between triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

6. Suppose the *y*-coordinates of each vertex in triangle ABC are multiplied by "*x*." Describe the relationship between triangle ABC and the newly created triangle.

   Case 1, $x < 0$:

   Case 2, $x > 0$:

7. With the coordinates of each vertex in L_1 and L_2 creating triangle ABC, add 2 to every *y*-coordinate and store the results in L_3. Now plot L_1 vs. L_2 AND L_1 vs. L_3. Describe the relationship between triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

8. With the coordinates of each vertex in L_1 and L_2 creating triangle ABC, add 3 to every *y*-coordinate and store the results in L_3. Now plot L_1 vs. L_2 AND L_1 vs. L_3. Describe the relationship between triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

9. With the coordinates of each vertex in L_1 and L_2 creating triangle ABC, add 5 to every *y*-coordinate and store the results in L_3. Now plot L_1 vs. L_2 AND L_1 vs. L_3. Describe the relationship between triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

10. Suppose "*f*" is added to every *y*-coordinate of the vertices of triangle ABC. Describe the relationship between triangle ABC and the newly created triangle.

11. Suppose you SUBTRACT "*f*" from every *y*-coordinate of the vertices in triangle ABC. Describe the relationship between triangle ABC and the newly created triangle as best as you can.

12. With the coordinates of each vertex in L_1 and L_2 creating triangle ABC, add 4 to every <u>*x*-coordinate</u> and store the results in L_3. Now plot L_1 vs. L_2 AND L_3 vs. L_2. Describe the relationship between triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

13. With the coordinates of each vertex in L_1 and L_2 creating triangle ABC, add 6 to every *x*-coordinate and store the results in L_3. Now plot L_1 vs. L_2 AND L_3 vs. L_2. Describe the relationship between triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

14. With the coordinates of each vertex in L_1 and L_2 creating triangle ABC, add –6 to every *x*-coordinate and store the results in L_3. Now plot L_1 vs. L_2 AND L_3 vs. L_2. Describe the relationship between triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

15. With the coordinates of each vertex in L_1 and L_2 creating triangle ABC, add –8 to every *x*-coordinate and store the results in L_3. Now plot L_1 vs. L_2 AND L_3 vs. L_2. Describe the relationship between triangle ABC and the newly created triangle. (Note: You may want to trace on each triangle for ideas.)

16. Suppose "*e*" is added to each *x*-coordinate of every point on triangle ABC. Describe the relationship between triangle ABC and the newly created triangle.

17. Make a conjecture about the placement of triangle ABC if "*e*" is added to each *x*-coordinate of every point on triangle ABC, and "*f*" is added to each *y*-coordinate of every point on triangle ABC.